

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	989	703/14.ccls.	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 16:41
L2	402	(model adj check\$3) and @ad<"20010113"	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 17:14
L3	50	L2 and trace	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 17:17
L4	20	L2 and disjoint	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 17:18
L5	3	(disjoint adj trace\$1) and @ad<"20010113"	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 17:21
L6	421	(multiple adj trace\$1) and @ad<"20010113"	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 17:21

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Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	(mutually-disjoint or (mutually adj disjoint) and trace\$1 and model).clm.	US-PGPUB	OR	OFF	2006/05/20 18:03
L2	1	(mutually-disjoint or (mutually adj disjoint) and trace\$1).clm.	US-PGPUB	OR	OFF	2006/05/20 18:03
L3	5	(mutually-disjoint or (mutually adj disjoint)).clm.	US-PGPUB	OR	OFF	2006/05/20 18:03
L4	3	((reachable adj set\$1) and trace\$1 and intersection\$1).clm.	US-PGPUB	OR	OFF	2006/05/20 18:08
L5	3	(disjoint and intersection\$1 and trace\$1 and intersection\$1).clm.	US-PGPUB	OR	OFF	2006/05/20 18:08

## EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"6691078".pn.	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 18:11
L2	136	(disjoint near path\$1) and @ad<"20010113"	US-PGPUB; USPAT; EPO; DERWENT	OR	OFF	2006/05/20 18:12

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» Key

IEEE JNL IEEE Journal or Magazine

IEE JNL IEE Journal or Magazine

IEEE CNF IEEE Conference Proceeding

IEE CNF IEE Conference Proceeding

IEEE STD IEEE Standard

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☐ 1. Static analysis and dynamic steering of time-dependent systems

Vicario, E.;

[Software Engineering, IEEE Transactions on](#)

Volume 27, Issue 8, Aug. 2001 Page(s):728 - 748

Digital Object Identifier 10.1109/32.940727

[AbstractPlus](#) | [References](#) | Full Text: [PDF\(1496 KB\)](#) IEEE JNL

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**IEEE JNL** IEEE Journal or Magazine  
**IEE JNL** IEE Journal or Magazine  
**IEEE CNF** IEEE Conference Proceeding  
**IEE CNF** IEE Conference Proceeding  
**IEEE STD** IEEE Standard

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» Key

IEEE JNL IEEE Journal or Magazine

IEEE JNL IEE Journal or Magazine

IEEE CNF IEEE Conference Proceeding

IEE CNF IEE Conference Proceeding

IEEE STD IEEE Standard

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van Lamsweerde, A.; Letier, E.;  
[Software Engineering, IEEE Transactions on](#)  
Volume 26, Issue 10, Oct. 2000 Page(s):978 - 1005  
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## 1 [A practical method for verifying event-driven software](#)

Gerard J. Holzmann, Margaret H. Smith

May 1999 **Proceedings of the 21st international conference on Software engineering**

Publisher: IEEE Computer Society Press

Full text available:  [pdf\(1.40 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** case studies, feature interactive, formal methods, model checking, reactive systems, software testing, software verification, telephone call processing


## 2 [Using model checking to generate tests from requirements specifications](#)



Angelo Gargantini, Constance Heitmeyer

October 1999 **ACM SIGSOFT Software Engineering Notes , Proceedings of the 7th European software engineering conference held jointly with the 7th ACM SIGSOFT international symposium on Foundations of software engineering ESEC/FSE-7**, Volume 24 Issue 6

Publisher: Springer-Verlag, ACM Press

Full text available:  [pdf\(1.44 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Recently, many formal methods, such as the SCR (Software Cost Reduction) requirements method, have been proposed for improving the quality of software specifications. Although improved specifications are valuable, the ultimate objective of software development is to produce software that satisfies its requirements. To evaluate the correctness of a software implementation, one can apply black-box testing to determine whether the implementation, given a sequence of system inputs, produces the ...


## 3 [Bandera: extracting finite-state models from Java source code](#)



James C. Corbett, Matthew B. Dwyer, John Hatcliff, Shawn Laubach, Corina S. Păsăreanu, Robby, Hongjun Zheng

June 2000 **Proceedings of the 22nd international conference on Software engineering**

Publisher: ACM Press

Full text available:  [pdf\(345.15 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Finite-state verification techniques, such as model checking, have shown promise as a cost-effective means for finding defects in hardware designs. To date, the application of these techniques to software has been hindered by several obstacles. Chief among these is the problem of constructing a finite-state model that approximates the executable behavior of the software system of interest. Current best-practice involves hand-construction of models which is expensive (prohibitive for all but ...

**Keywords:** abstract interpretation, model checking, model extraction, program specialization, program verification, slicing

4 Three approximation techniques for ASTRAL symbolic model checking of infinite state real-time systems



Zhe Dang, Richard A. Kemmerer

June 2000 **Proceedings of the 22nd international conference on Software engineering**

**Publisher:** ACM Press

Full text available: pdf(359.05 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

ASTRAL is a high-level formal specification language for real-time systems. It has structuring mechanisms that allow one to build modularized specifications of complex real-time systems with layering. Based upon the ASTRAL symbolic model checker reported in [13], three approximation techniques to speed-up the model checking process for use in debugging a specification are presented. The techniques are random walk, partial image and dynamic environment generation. Ten mutation tests on a rai ...

**Keywords:** ASTRAL, formal methods, formal specification and verification, model checking, real-time systems, state machines, timing requirements

5 HSIS: a BDD-based environment for formal verification



A. Aziz, F. Balarin, S.-T. Cheng, R. Hojati, T. Kam, S. C. Krishnan, R. K. Ranjan, T. R. Shiple, V. Singhal, S. Tasiran, H.-Y. Wang, R. K. Brayton, A. L. Sangiovanni-Vincentelli

June 1994 **Proceedings of the 31st annual conference on Design automation**

**Publisher:** ACM Press

Full text available: pdf(91.11 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

6 Verification of time partitioning in the DEOS scheduler kernel



John Penix, Willem Visser, Eric Engstrom, Aaron Larson, Nicholas Weininger

June 2000 **Proceedings of the 22nd international conference on Software engineering**

**Publisher:** ACM Press

Full text available: pdf(111.58 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper describes an experiment to use the Spin model checking system to support automated verification of time partitioning in the Honeywell DEOS real-time scheduling kernel. The goal of the experiment was to investigate whether model checking could be used to find a subtle implementation error that was originally discovered and fixed during the standard formal review process. To conduct the experiment, a core slice of the DEOS scheduling kernel was first translated without abstraction ...

7 Decoupling synchronization from local control for efficient symbolic model checking of statecharts

William Chan, Richard J. Anderson, Paul Beame, David H. Jones, David Notkin, William E. Warner

May 1999 **Proceedings of the 21st international conference on Software engineering**

**Publisher:** IEEE Computer Society Press

Full text available: pdf(1.31 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** binary decision diagrams, fault tolerance, formal methods, formal verification, software specification, statecharts, symbolic model checking

## 8 Fault origin adjudication



Karthikeyan Bhargavan, Carl A. Gunter, Davor Obradovic

August 2000 **Proceedings of the third workshop on Formal methods in software practice**

**Publisher:** ACM Press

Full text available: pdf(522.20 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

When a program P fails to satisfy a requirement R supposedly ensured by a detailed specification S that was used to implement P, there is a question about whether the problem arises in S or in P. We call this determination fault origin adjudication and illustrate its significance in various software engineering contexts. The primary contribution of this paper is a fra ...

## 9 Formal verification of FIRE: a case study



Jae-Young Jang, Shaz Qadeer, Matt Kaufmann, Carl Pixley

June 1997 **Proceedings of the 34th annual conference on Design automation DAC '97**

**Publisher:** ACM Press

Full text available: pdf(93.19 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)



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We present our experiences with the formal verification of an automotive chip used to control the safety features in a car. We used a BDD based model checker in our work. We describe our verification methodology for verifying a very complicated property on a relatively large design. We also describe the bugs that were found and present our views on how to make model checking an effective integrated part of the design flow for complex hardware systems.

## 10 Using the ASTRAL model checker to analyze mobile IP

Zhe Dang, Richard A. Kemmerer

May 1999 **Proceedings of the 21st international conference on Software engineering**

**Publisher:** IEEE Computer Society Press

Full text available: pdf(1.16 MB)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** ASTRAL, Encryption protocols, formal methods, formal specification and verification, real-time systems, state machines, timing requirements

## 11 Forward model checking techniques oriented to buggy designs

Hiroaki Iwashita, Tsuneo Nakata

November 1997 **Proceedings of the 1997 IEEE/ACM international conference on Computer-aided design**

**Publisher:** IEEE Computer Society

Full text available: pdf(91.22 KB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)



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Forward model checking is an efficient symbolic model checking method for verifying realistic properties of sequential circuits and protocols. In this paper, we present the techniques that modify the order of state traversal on forward model checking, and that dramatically improve average CPU time for finding design errors. A failing property has to be checked again and again to analyze the bug until it is corrected. The techniques, therefore, can have significant impacts on actual verification ...


**Keywords:** formal verification, symbolic state traversal, symbolic model checking, forward model checking

## 12 Alcoa: the alloy constraint analyzer



Daniel Jackson, Ian Schechter, Hya Shlyahter

June 2000 **Proceedings of the 22nd international conference on Software**

Full text available:  [pdf\(145.10 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Alcoa is a tool for analyzing object models. It has a range of uses. At one end, it can act as a support tool for object model diagrams, checking for consistency of multiplicities and generating sample snapshots. At the other end, it embodies a lightweight formal method in which subtle properties of behaviour can be investigated. Alcoa's input language, Alloy, is a new notation based on Z. Its development was motivated by the need for a notation that is more closely tailored to ob ...

**Keywords:** constraint satisfaction, formal specifications, model checking, object models, relational logic, software analysis

### 13 Fitting formal methods into the design cycle



K. L. McMillan

June 1994 **Proceedings of the 31st annual conference on Design automation**

**Publisher:** ACM Press

Full text available:  [pdf\(325.61 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)


### 14 A formal basis for architectural connection



Robert Allen, David Garlan

July 1997 **ACM Transactions on Software Engineering and Methodology (TOSEM)**,  
Volume 6 Issue 3

**Publisher:** ACM Press

Full text available:  [pdf\(463.23 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

As software systems become more complex, the overall system structure—or software architecture—becomes a central design problem. An important step toward an engineering discipline of software is a formal basis for describing and analyzing these designs. In the article we present a formal approach to one aspect of architectural design: the interactions among components. The key idea is to define architectural connectors as explicit semantic entities. These are specified as a col ...

**Keywords:** WRIGHT, formal models, model-checking, module interconnection, software analysis


### 15 Speeding up symbolic model checking by accelerating dynamic variable reordering



Christoph Meinel, Christian Stangier

March 2000 **Proceedings of the 10th Great Lakes symposium on VLSI**

**Publisher:** ACM Press

Full text available:  [pdf\(500.80 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Symbolic Model checking is a widely used technique in sequential verification. As the size of the OBDDs and also the computation time depends on the order of the input variables, the verification may only succeed if a well suited variable order is chosen. Since the characteristics of the represented functions are changing, the variable order has to be adapted dynamically. Unfortunately, dynamic reordering strategies are often very time consuming and sometimes do not provide any improvement of ...

### 16 Safety critical systems based on formal models



Lars Asplund, Kristina Lundqvist

December 2000 **ACM SIGAda Ada Letters**, Volume XX Issue 4

**Publisher:** ACM Press

Full text available:  [pdf\(732.05 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

The Ravenscar profile for high integrity systems using Ada 95 is well defined in all real-

time aspects. The complexity of the run-time system has been reduced to allow full utilization of formal methods for applications using the Ravenscar profile. In the Mana project a tool set is being developed including a formal model of a Ravenscar compliant run-time system, a gnat compatible run-time system, and an ASIS based tool to allow for the verification of a system including both COTS and code that ...

## 17 Verification techniques for cache coherence protocols



Fong Pong, Michel Dubois

March 1997 **ACM Computing Surveys (CSUR)**, Volume 29 Issue 1

**Publisher:** ACM Press

Full text available: [pdf\(1.25 MB\)](#)

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In this article we present a comprehensive survey of various approaches for the verification of cache coherence protocols based on state enumeration, (symbolic model checking, and symbolic state models. Since these techniques search the state space of the protocol exhaustively, the amount of memory required to manipulate that state information and the verification time grow very fast with the number of processors and the complexity of the protocol mechanism ...

**Keywords:** cache coherence, finite state machine, protocol verification, shared-memory multiprocessors, state representation and expansion

## 18 Efficient generation of counterexamples and witnesses in symbolic model checking



E. M. Clarke, O. Grumberg, K. L. McMillan, X. Zhao

January 1995 **Proceedings of the 32nd ACM/IEEE conference on Design automation**

**Publisher:** ACM Press

Full text available: [pdf\(225.22 KB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

## 19 Strategic directions in real-time and embedded systems



John A. Stankovic

December 1996 **ACM Computing Surveys (CSUR)**, Volume 28 Issue 4

**Publisher:** ACM Press

Full text available: [pdf\(209.23 KB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

## 20 Formal specification and verification of a dataflow processor array

Thomas A. Henzinger, Xiaojun Liu, Shaz Qadeer, Sriram K. Rajamani

November 1999 **Proceedings of the 1999 IEEE/ACM international conference on Computer-aided design**

**Publisher:** IEEE Press

Full text available: [pdf\(98.54 KB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We describe the formal specification and verification of the VGI parallel DSP chip [1], which contains 64 compute processors with ~30K gates in each processor. Our effort coincided in time with the "informal" verification stage of the chip. By interacting with the designers, we produced an abstract but executable specification of the design which embodies the programmer's view of the system. Given the size of the design, an automatic check that even one of the 64 processors sati ...

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NUSMV: a new symbolic **model checker** - group of 12 »

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AJ Cimatti, EJ Clarke, FJ Giunchiglia, MJ Roveri - International Journal on Software Tools for Technology ..., 2000 - Springer

... N U SMV: a new symbolic **model checker** ... NuSMV is the result of the reengineering and reim- plementation of the CMU SMV [26,47] symbolic **model checker**. ...

Cited by 108 - [Web Search](#)

[PS] Automated software testing using model-checking - group of 3 »

J Callahan, F Schneider, S Easterbrook - Proceedings 1996 SPIN Workshop, 1996 - cis.upenn.edu

... While the partitions created by a CCC are **disjoint** ... specific tests into one or more partitions using a **model checker**. We can determine if a **trace** belongs to a ...

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... Verification of a Behavioural Subset of UML Statechart Diagrams Using the SPIN **Model-checker** - group of 6 »

DA Latella, IA Majzik, MA Massink - Formal Aspects of Computing, 1999 - Springer

... as the work constitutes a basis for a PROMELA/SPIN based **model-checker** for UML ... where F is a finite set of sequential automata with mutually **disjoint** sets of ...

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A partial approach to model checking - group of 8 »

P Godefroid, P Wolper - Logic in Computer Science, 1991. LICS'91., Proceedings of ..., 1991 - ieeeexplore.ieee.org

... i (where S, is the set of states of A,) are pairwise **disjoint**. words accepted by AG (all states of AG considered ac- cepting). We define the **trace** behavior of ...

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[PS] Is your **model checker** on time - group of 7 »

L Aceto, F Laroussinie - Proc. 24th Int. Symp. Math. Found. Comp. Sci.(MFCS'99), ..., 1999 - lsv.ens-cachan.fr

... Is your **Model Checker** on Time? ... The complexity of implementation verification for (concurrent) programs is studied in, eg, [39,56,63], where both **trace**- and tree ...

Cited by 29 - [View as HTML](#) - [Web Search](#) - [BL Direct](#)

Using a **model checker** to test safety properties - group of 5 »

P Ammann, W Ding, D Xu - International Conference on Engineering of Complex Computer ..., 2001 - doi.ieeecs.org

... 0 , some dangerous xy -**trace** is a prefix of a **trace** that leads ... 3 **MODEL CHECKER** IMPLEMENTATION ... change the seman- tics, that is, p 1 :: pm are **disjoint** (if the ...

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[PS] PV: a **model-checker** for verifying ltl-x properties - group of 3 »

R Nalumasu, G Gopalakrishnan - Fourth NASA Langley Formal Methods Workshop, 1997 - techreports.laarc.nasa.gov

Page 1. PV: A **Model-Checker** for Verifying LTL-X Properties Ratan Nalumasu Ganesh Gopalakrishnan ... that the domains of i ! l and i ! g are **disjoint** and that ...

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Designing a LTL **Model-Checker** Based on Unfolding Graphs - group of 2 »

JM Couvreur, S Grivet, D Poitrenaud - LECTURE NOTES IN COMPUTER SCIENCE, 2000 - Springer

... Designing a LTL **Model-Checker** Based on Unfolding Graphs ... We call **trace** function  $\Phi$

AP the mapping in  $S \rightarrow [AP \dots]$  Post is aP/T net (P and T are **disjoint** sets of ...

Cited by 3 - [Web Search](#) - [BL Direct](#)

Generating Test Oracles via Model Checking - group of 4 »

JR Callahan, SM Easterbrook, TL Montgomery - NASA/WVU Software Research Lab, Fairmont, WV, Technical ..., 1998 - cis.upenn.edu

... generation mechanism found in most **model checker** tools. ... into a complete cover of

**disjoint** equivalence partitions on ... If an inconsistency between a **trace** and the ...

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[PS] [Mocha: Exploiting Modularity in Model Checking - group of 7 »](#)

L de Alfaro, R Alur, R Grosu, T Henzinger, M Kang, ... - University of California at Berkeley Department of ..., 2000 - [www-cad.eecs.berkeley.edu](#)

... The symbolic **model checker** is based on BDD engines ... Implementation verication by checking **trace** containment between ... modules, if they have **disjoint** sets of ...

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DA Latella, IA Majzik, MA Massink - Formal Aspects of Computing, 1999 - Springer

... as the work constitutes a basis for a PROMELA/SPIN based **model-checker** for UML ... where F is a finite set of sequential automata with **mutually disjoint** sets of ...

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[Model Checking Coloured Petri Nets Exploiting Strongly Connected Components - group of 3 »](#)

A Cheng, S Christensen, KH Mortensen - Proceedings of the International Workshop on Discrete Event ..., 1996 - daimi.au.dk

... expressing liveness properties since liveness is expressed by means of transition information.) For this purpose we introduce two **mutually** recursively defined ...

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[Model Checking Complete Requirements Specifications Using Abstraction - group of 10 »](#)

RV Bharadwaj, CLV Heitmeyer - Automated Software Engineering, 1999 - Springer

... Before practical software specifications can be analyzed efficiently using a **model checker**, the state explosion problem must be addressed, ie, the size of the ...

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[Checking general safety criteria on UML statecharts - group of 5 »](#)

Z Pap, I Majzik, A Pataricza - SAFECOMP, 2001 - Springer

... criterion: for each state and each trigger event, the guard conditions must be **mutually disjoint**. ... We use the **model checker** SPIN [10] as external tool to decide ...

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[An Outline of PVS Semantics for UML Statecharts - group of 2 »](#)

I Traore - Journal of Universal Computer Science, 2000 - jucs.org

... used to conduct a formal analysis using the PVS **modelchecker**. ... two or more concurrent substates or into **mutually** exclusive **disjoint** substates (also ...

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[Model Checking and Other Ways of Automating Formal Methods - group of 6 »](#)

J Rushby - Position paper for panel on Model Checking for Concurrent ..., 1995 - csl.sri.com

... a table construct, and can generate the proof obligations for **mutually disjoint** and exhaustive ... Using the **model checker** we are now also able to check certain ...

Cited by 5 - [View as HTML](#) - [Web Search](#)

[Model-Checking Over Multi-Valued Logics - group of 5 »](#)

M Chechik, S Easterbrook, V Petrovykh - Proceedings of FME'01, 2001 - Springer

... Given a system and a property, a **model checker** builds the reachability graph (explicitly or symbolically) by exhaustively exploring the state-space of the ...

Cited by 40 - [Web Search](#) - [BL Direct](#)

[Experiences with the Application of Symbolic Model Checking to the Analysis of Software ... - group of 2 »](#)

R Anderson, P Beame, W Chan, D Notkin - Lecture Notes in Computer Science, 1999 - Springer

... in terms of cases, it is natural require that the cases are **mutually disjoint**. ... were close to the maximum size which could be evaluated with a **model checker**. ...

Cited by 3 - [Web Search](#) - [BL Direct](#)

[Applying the SCR Requirements Method to a Simple Autopilot - group of 9 »](#)

R Bharadwaj, C Heitmeyer - Proceedings of the Fourth NASA Langley Formal Methods ..., 1997 - chacs.itd.nrl.navy.mil

... Foreexample, Atlee and Gannon use a language based on logic to model the required behavior of a cruise control sys- tem 3 and a **model checker** to detect ...

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## Efficient Decompositional Model Checking for Regular Timing Diagrams - group of 9 »

N Amla, EA Emerson, KS Namjoshi - Correct Hardware Design and Verification Methods: 10th IFIP ..., 1999 - Springer

... Section 4 describes how the algorithms are used with the **model checker** VIS

[3 ...  $k$  and  $[k, k]$  as  $= k$ . – CD is a collection of **mutually disjoint** sets of ...

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